dweller in the State. References, however, are required throughout this volume from the illustrations to the text. Bulletin No. xvii. is on the "Abandoned Shore-lines of Eastern Wisconsin," by Mr. J. W. Goldthwait (1907), and is a study of the development and passing away of the lakes and lake-extensions associated with later Glacial times. The evidences of warping in the shore-terraces through earth-movement are of special interest. Mr. E. C. Harder has contributed a study of the relations of streams and joint-systems to the Bulletins of the University of Wisconsin (No. 138, 1906), in which the south-western area of the State is dealt with. The maps, however, do not at once carry conviction, owing to the obvious influence of large topographic features on the courses of many of the smaller streams.

The Iowa Geological Survey issued its fourteenth annual report (for 1905) in 1906, a thick volume giving much information on the economic and general geology of the State. The descriptions, fully illustrated, are published county by county, and the stratigraphy concerns Ordovician and Silurian rocks especially. Next in interest to these come the glacial drifts, often overlain by loess of the usual problematic origin. The value of this loess as a soil-provider is justly dwelt on on p. 393. The huge boulders from northern Minnesota and Wisconsin, often of red granite, remind one of those of Holland and north Germany, and similarly serve as quarries for the farmer. The scope of this survey covers forestry and the observation of the local flora.

The Maryland Geological Survey continues its well-printed series of volumes with one on the Pliocene and Pleistocene deposits (1906), one on Calvert County (1907), and one on St. Mary's County (1907). In the county volumes we again note how geological surveys in the United States tend to become natural history surveys, with the view of the application of all branches of observation to local education and the local industries. This is a return, and we venture to think a welcome one, towards the broad and wholesome "statistical surveys" of the eighteenth and early nineteenth centuries; and surely the climate, plant-associations, and human activities of a district are so closely united with topography and geology that a united survey under one scientific department seems the only rational way of studying a political division. A certain amount of repetition, even in diagrams and illustrations, is, of course, inevitable, if each county is separately dealt with, but local knowledge is no doubt enlarged by such a system. The palæontological studies given in the Pliocene volume show that so-called "pure" science is in no danger of being eclipsed. The superficial deposits of Maryland (called "surficial" in the memoir) are "the last of a long series of unconsolidated beds which began to be deposited in Lower Cretaceous and possibly Jurassic time, and have continued on with interruptions down to the present" (p. 136). Five systems of terraces are traced in the coastal plain, the highest being the oldest. These are uplifted terraces of marine deposition, and represent the seaward edges of submarine platforms, successively constructed out of the products of coast-erosion and of materials swept by currents against the shore (p. 108). It is interestingly urged that "the Atlantic seaboard has been repeatedly elevated when loaded and depressed when lightened" (p. 137).

The domes of folding in Maryland, its Upper Devonian fauna, its climate, and the historical origin of its counties are dealt with in the Johns Hopkins University Circular, "Notes from the Geological Laboratory" (July, 1907). The work of the University, the State Survey, and the general United States Geological Survey seem happily combined (p. 2) in the interests of research.

Dr. J. A. Udden publishes in the Bulletin of the University of Texas, No. 93. 1907, an account of the "Geology of the Chisos Country, Texas," which is of the more value since the Geological Survey of that State has been discontinued.

Lastly, workers in Silurian fields will be interested in Mr. E. M. Kindle's paper on the "Occurrence of the Silurian Fauna in Western America" (*Amer. Journ. Sci.*, vol. xxv., February, p. 125). "Silurian" is used in the restricted sense now common in England, and beds of this age are traced in the Wasatch Mountains of Utah and Alaska. *Conchidium Knightii* is large and abundant on Kuiu Id. in S.E. Alaska, though not hitherto known from the United States. Another old acquaintance, *Pentamerus oblongus*, is abundant in the Utah fauna.

G. A. J. C.

THE ROYAL SANITARY INSTITUTE.

THE annual congress of the Royal Sanitary Institute was held at Cardiff last week. Many interesting papers were read, and several useful discussions were arranged. A large proportion of the papers fittingly dealt with practical and demonstrative matters arising out of the duties and work of sanitary and educational authorities and the officials who serve them. There was a dearth of original contributions of a scientific nature, but those contributions which appear to call for special reference are the following:—

Dr. W. G. Savage read a paper upon "The Examination of Sausages and their Hygienic Preparation." While sausages are usually composed of good meat, finely minced and mixed with flour, spices, and flavouring agents, such as salt, pepper, and sage, there are no definite guiding standards in this country either as to their composition, the presence and amount of preservatives, or their bacterial content. Hitherto there does not appear to have been any investigation dealing with the bacteria of sausages, and Dr. Savage has recently examined twelve different samples, purchased on the open market, in order to see how far typical excretal organisms are present in them. Most of the sausages examined were quite recently made, and the results show that *Bacillus Coli* of definite excretal type were always present in large numbers, whereas the ordinary musculature, bread, and other constituents of sausages in their pure state do not contain *B. Coli*. Although this bacillus is the distinctive organism of excreta, and the fact of its presence in considerable numbers in sausages is not a nice matter to contemplate, it must be realised that the bacillus referred to is found in the intestines and given off from the dejecta of animals generally. These and other facts referred to by Dr. Savage call for the framing of some standard by which the purity and wholesomeness of these articles of food can be judged.

An instructive paper was presented by Mr. H. Percy Boulnois upon "The Utilisation of Residuals from Refuse Destructors," and two other papers were contributed to the congress upon the same subject. The amount of refuse produced in a town in this country is about a quarter of a ton per head of population per annum, and after this has been cremated in a destructor, the residual clinker represents from 25 to 33 per cent. of the refuse burnt. Of the many methods which have been devised for utilising this material, reference was made to a very recent method which involves the use of the lightning dust crusher for converting furnace clinker into the form of poudrette. The lightning dust crusher consists of a comparatively small steel case containing four or six steel hammers, each weighing about 50 lb. The axle on which these hammers hang is rotated by machinery at the rate of about 1000 revolutions per minute. The machine can be fed at the rate of four tons an hour, and the poudrette escaping finds a market, as a manure, at 2*s.* 3*d.* per ton. It is quite inoffensive to the smell, and recently Mr. H. J. Coles, the surveyor of Market Harborough, has, by mixing the poudrette with tarry compounds, made very serviceable fuel briquettes, with a calorific value amounting to one-third that of the best coal.

Mr. Reginald Brown had some experiences to offer with reference to "The Surface Treatment of Roads in Relation to Dust Laying." He recommended the use of oil-tar, which is a by-product of the manufacture of gas from oil, and varies in its composition according to the temperature of production, the nature of the retort or producing plant, and of the oil used. The lack of uniformity in composition, however, does not seriously affect its suitability for road treatment. From extended experience it has been found that four dressings are required for each watering season, and that on an average one gallon will cover ten superficial yards. The cost of "surfacing" a road with oil-tar averages one penny for four dressings (no grit being required for covering), and this works out

at 58*l.* 13*s.* 4*d.* per mile per watering season, a figure which contrasts favourably with the cost of tar painting and approximates very closely to that of watering. In some instances the material is applied hot, but Mr. Brown has used it upon all the streets of the Southall-Norwood Urban District in the cold state by means of an ordinary watering cart, with excellent results. The appearance of the road treated with oil-tar is that of a newly-laid wood pavement, and the odour given off is similar. It is his opinion that the use of both coal-tar and oil-tar will become pretty general, the use of oil-tar being adopted where it can be obtained, and coal-tar where oil-tar is not manufactured. The employment of "akonia," calcium chloride, "halmite," and "pulvicide" is also considered in the paper. But oil-tar is shown to possess certain advantages, more especially of economy, over other methods.

Mr. W. D. Scott-Moncrieff contributed a paper upon "Some Recent Experiments on the Biolysis of Sewage." The immediate objects of his investigation were to discover what periods of hydrolysis gave a sufficient standard of purification with measured conditions of flow, and the experiments are claimed to have shown, for the first time, not only the behaviour of the sewage in varying circumstances of sojourn, &c., in the septic tank, but also to what extent a well-matured filter working under proper conditions is capable of dealing with the polluting organic matters under widely varying conditions, as regards different periods of hydrolysis. It should be noted, however, that the author points out that the results he has obtained are strictly confined to the special conditions that produced them, and that they do not justify any generalisations.

A noteworthy paper upon "The Limit of School Children's Capacity for Attention" was read by Prof. W. Phillips. After referring to the various experimental inquiries into this question, which have involved the use of various forms of Mosso's ergograph, or fatigue recorder, and Griesbach's æsthesiometer, and many experiments designed to test the rate of deterioration in mental work done at different times of the day and on different days of the week, Prof. Phillips discussed the useful results which all this work has led to. His conclusions are as follows:—

(1) The various tests seem to agree on one point, viz., that during an ordinary school session children can maintain a more even degree of attention, if one or two intervals of rest are included. Where two of ten minutes each can be arranged, more advantage is gained than from one of twenty minutes. (2) The tests seem to agree, too, in showing that a child's attention wanes more rapidly in the afternoon than in the morning. Therefore those teachers who have been accustomed to place the less taxing subjects of instruction in the afternoon seem justified. (3) The various branches of mathematics seem, *ceteris paribus*, to make a greater demand on the attention than most other subjects. This result has long ago been anticipated by those teachers who place mathematics early in the morning session. (4) Gymnastics is not of necessity a mentally recuperative subject, some of the tests proving that children were often tired after a lesson in it. (5) In connection with the discussion of the extent of the fatigue caused by gymnastics, it soon becomes obvious that the results do not depend on the nature of the exercise alone, but also on the teacher. If the latter is a strict disciplinarian, the fatigue may be of a pronounced character. (6) It is clear that attention depends on numerous factors, such as the age, health, and nutrition of the child, the temperature and ventilation of the class-room, &c. But above all it depends on the child's training and education.

RECENT METEOROLOGICAL PUBLICATIONS.

THE report of the second Norwegian Arctic Expedition of 1898–1902,[1] edited by Dr. H. Mohn and published at the expense of the Fridtjof Nansen fund for the advancement of science, forms a valuable addition to the meteorology of a little-known region of the earth's surface.

[1] Report of the Second Norwegian Arctic Expedition in the *Fram*, 1898–1902. No. 4, Meteorology. By H. Mohn. (Kristiania: Published by Videnskabs-Selskabet i Kristiania, 1907.)

The *Fram* left Christiania on June 24, 1898, and sailed, *via* Godhavn, Upernivik, Foulkefjord, and Cocked Hat, to the first winter quarters, which were reached in September. As the methods of observation were different when the ship was anchored from when she was under way, the results are given separately, and as those obtained at the winter quarters are most complete they are given in part i.

The positions of these winter quarters and the length of stay at each are shown in the following table:—

Place	Lat. N.	Long. W.	Duration of stay.
Rice Strait ...	78° 45·7′	74° 56·5′	1898, Sept. 19 to 1899, July 24
Havnefjord ...	76 29·4	84 3·7	1899, Oct. 23 to 1900, Aug. 9
Gaasefjord I. ...	76 48·9	88 39·5	1900, Sept. 18 to 1901, Aug. 12
,, II. ...	76 39·8	88 38·3	1901, Sept. 6 to 1902. July 21

The interval August 12 to September 6, 1901, was spent sailing about in the Gaasefjord.

Up to June, 1899, Dr. Johan Svendsen—the physician of the expedition—who had taken part in the examining and comparing of the instruments before they left Norway, was the meteorologist-in-chief, but his lamented death in that month robbed the expedition of his further invaluable services.

The pressure observations were made with the same barometer—a Kew standard Adie 850—throughout, and readings were taken every two hours from midnight to midnight. A small number of records were, from one cause and another, omitted, but the gaps have been filled in by the interpolation of readings from a Richard barograph. In the tables the values, reduced to standard temperature, barometer, gravity, and sea-level, are given for the bi-hourly readings each day; daily and monthly means, and the monthly means for each even hour, are also shown. The mean pressures for the months exhibit a regular annual period, with a chief maximum in March, a secondary maximum in November, a principal minimum in August, and a secondary minimum in January. The range of pressure is 11·8 mm., and the yearly mean pressure for the whole region is 761·40 mm. Other tables summarise the lowest and highest pressures recorded, and the differences between the mean highest and mean lowest pressures in each month are given. The oscillation of pressure is shown to be greatest in February and least in August, greatest in winter, least in summer.

Owing to the rolling of the *Fram* only a few of the thermometers came back safely to Norway, but there is sufficient evidence on which to base the discussion of errors. The reduced values for temperature are tabulated in much the same form as those for pressure, and the summaries show that during the "dark season" (November, December, January), when the sun remains below the horizon, the diurnal variation vanishes entirely. The daily range of temperature shows an annual period with a maximum (3°·47 C.) in April; during the three summer months it is practically stationary at 1°·7 C. to 1°·8 C. The respective effects of clear and overcast skies on the temperatures recorded are shown very clearly (p. 113). With a "clear sky" in the months October to January, the daily minimum occurs in the day hours and the maximum at night, but with an "overcast sky" the ordinary daily period obtains in every month. Dr. Mohn suggests that the investigation of air temperatures in the Arctic and Antarctic regions deserves greater attention, the final results of which would probably throw considerable light on the question of radiation from and to the earth in the lower atmosphere.

The lowest temperature recorded by the expedition (−51°·3 C.) was obtained on January 20, 1901, a year that was marked by unusually low temperatures, and the highest (13°·3 C.) was recorded on July 9, 1902; thus the absolute range becomes 64°·6. In the mean there are about thirty-four days per annum when the temperature falls below −40°; February is marked by exceptionally high maximum temperatures, especially in 1900.

The other meteorological factors, wind, storms, clouds, precipitation, &c., are dealt with by Dr. Mohn in a similarly comprehensive fashion, but enough has been said to show that in this volume we have data of unique value which should prove of great service in current meteorology. The work has obviously been done with conscientious care and thoroughness; the only pity is that the period for which observations are available is so brief.